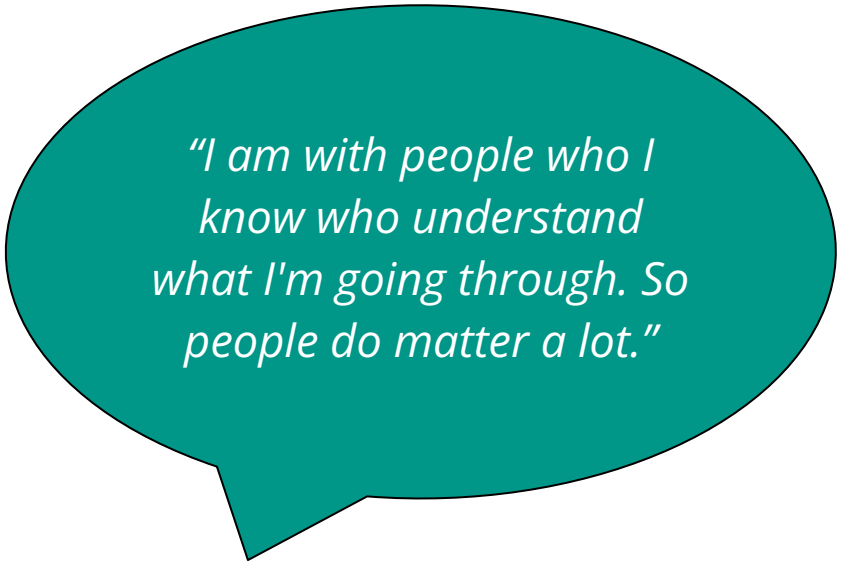
Undergraduate Students' Sense of Community in Introductory Math and Statistics Courses

Electronic **C**onference **O**n **T**eaching **S**tatistics
May 24, 2022

Maria Tackett and Shira Viel
Duke University

Outline

- Motivation & research objectives
- Methods
- Results
- Conclusions
- Next steps & future work



🔗 **bit.ly/ecots22-socqs**

Research objectives

- Identify **pedagogies, policies, and structures** in introductory quantitative science courses which correlate with an increased sense of classroom community

- Better understand how students in introductory quantitative science courses **perceive and experience classroom community**

- Analyze how these perceptions and experiences **differ across a diverse population**, including along demographic axes and learning modalities and preferences

Methods

Fall 2020 - Spring 2022 ◍ Intro quant sci courses ◍ Remote, hybrid, and in-person

Survey

Classroom Community Scale - Short Form [Cho & Demmans Epp, 2019], adapted from CCS [Rovai, 2002] + demographics + learning modality

Statistical Modeling

Structural equation modeling used to identify student characteristics and classroom practices associated with connectedness and learning support

Pilot Focus Groups

Series of focus groups to better understand student experience

Jamboard: What is classroom community?

🔗 https://bit.ly/socqs-jamboard

CCS-Short Form [Cho & Demmans Epp, 2019]

Item	Subscale	Question
1	Connectedness	I feel that students in this course care about each other.
2	Connectedness	I feel connected to others in this course.
3	Learning Support	I feel it is hard to get help when I have a question.
4	Learning Support	I feel uneasy exposing gaps in my understanding.
5	Learning Support	I feel reluctant to speak openly.
6	Connectedness	I feel that I can rely on others in this course.
7	Learning Support	I feel that I am given ample opportunities to learn.
8	Connectedness	I feel confident that others will support me.

Modeling

- Structural equation modeling used to identify student characteristics and classroom practices associated with connectedness and learning support
  - Models specified to take into account association between connectedness and learning support
- **Preliminary results:**
  - Multi-week group assignments are a statistically significant predictor of connectedness and learning support
  - Race/ethnicity is a statistically significant predictor of connectedness but not learning support

Results: Group projects

Factor	Variable	Estimate
Learning Support	Connectedness	0.492***
	Group Projects	- 0.107*
Connectedness	Group Projects	0.222**

*p < 0.1, **p < 0.05, ***p < 0.01

✅ Sustained interaction helps promote connectedness with peers

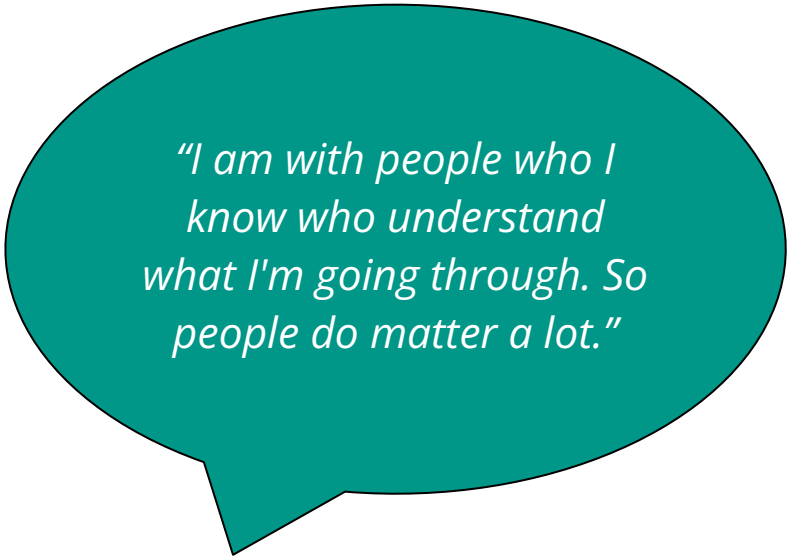
⚠️ Graded group work can hinder sense of supportive learning environment

"I feel like with a lot of classes, students have a hard time feeling anything other than awkward at the very beginning of the class. And if collaboration has started off from the beginning, then it kind of fostered that sense of shared identity"

Results: Identity

Factor	Variable	Estimate
Learning Support	Connectedness	0.490***
	Race / Ethnicity	Not significant
Connectedness	Asian	-0.025
	Black	-0.325*
	Hispanic	-0.009
	Multirace	0.044
	Other	-0.628***

*p < 0.1, **p < 0.05, ***p < 0.01 Baseline: White, Non-Hispanic



⚠️ Mixed results about the impact of personal identity, but students from underrepresented groups tend to have weaker sense of connectedness

Pilot focus group themes

Click here to see interactive tree map

Archetypes: who are our students?

Student A

Likes to work alone; Instr. is main support

"When you're like.. going to say, curve up like 40%, or something absurd, you're like, Oh, I would study with you, and I probably should, but if I help you guys, then…' It's like self-interest."

Student B

Entered with friends; Looks to them for help

"The only people that I was friends with in that class or that I would consider forming community with were people that I knew from outside of the class."

Student C

Wants community; doesn't always have it

"It does feel a bit exclusive, it's not like you can't reach out to them, knowing that they probably would answer you, but it wouldn't be the most welcoming thing"

Student D

Doesn't want or expect community

"Because when I think of a lecture I don't think of talking with other people… I'm not looking for community when I go into a lecture. I go into it to hear the professor."

How can we support these students?

Understanding that these 4 students exist in your course, what is something you might do to help each of these students feel that their learning is supported in your course?

Preliminary takeaways

For many students, connectedness to peers and the instructor is highly correlated with their perception of the learning environment.

- ✓ Create opportunities for many different modes of interaction
  - Particularly include sustained interaction with same small group
- ✓ Avoid policies that inadvertently foster competition
- ✓ Attend to student identity and experiences of students from different backgrounds

Current work and next steps

- **In-progress**
  - Preprint validating use of CCS-SF survey with undergraduate students in introductory math and statistics courses
  - Additional modeling to understand interaction between identity and classroom practices
  - Internal white paper with findings and recommendations for colleagues

- **Future data collection**
  - Refine instructor survey to explore relationship between grading policies and sense of community
  - Incentivize higher focus group participation and survey response rates
  - Conduct identity-specific focus groups to better understand experiences

Acknowledgements

- Kim Manturuk and Duke Learning Innovation
- Sarwari Das
- Maggie Poulos
- Joe Choo

This project is funded by the Carry the Innovation Forward Grant

Thank you!

✉️ maria.tackett@duke.edu

✉️ shira.viel@duke.edu

References

- Cho, J., & Demmans Epp, C. (2019). *Improving the Classroom Community Scale: Toward a Short-Form of the CCS*. Presented at the American Educational Research Association (AERA) Annual Meeting, Toronto, Canada.

- Rovai, A. P. (2002). Development of an instrument to measure classroom community. *The Internet and Higher Education*, *5*(3), 197–211. https://doi.org/10.1016/S1096-7516(02)00102-1

Appendix

Implementation

Survey

Fall 2020 - Spring 2022

- Emailed rosters via Qualtrics with auto-reminders
- Optional; Near end-of-term; Embedded consent form
- Random drawing for two $25 Amazon gift cards
- Course data gathered via post-term instructor survey

⚠️ *Low response rates (17.5% overall F20-S21, corresponding to 351 students)*

Pilot Focus Groups

Fall 2021 - Spring 2022

- Recruitment via end-of-survey link
- Facilitated by Duke Learning Innovation staff
- $15 Amazon gift card for participation
- 5 focus groups with 1-3 students each (12 total)

✅ *Highest response rate to special recruitment at start of Spring 2022 semester*